CLAIMS

1. A radio frequency optical transmission system for optically transmitting a radio frequency signal, the system comprising:

a control station for generating two phase-conjugated optical signals having their intensities modulated with the radio frequency signal, and transmitting the generated two phase-conjugated optical signals in a predetermined transmission form via an optical transmission path; and

at least one base station for receiving the two phase-conjugated optical signals transmitted in the predetermined transmission form from the control station via the optical transmission path, and selectively processing one of the received two phase-conjugated optical signals which has a greater signal power intensity.

2. The radio frequency optical transmission system according to claim 1, wherein the control station includes:

a light source for outputting an optical signal; and

an optical intensity modulation section for modulating an intensity of the optical signal outputted from the light source with the radio frequency signal, and for generating two phase-conjugated optical signals based on the optical signal having its intensity modulated, and transmitting the generated two

phase-conjugated optical signals via the optical transmission path.

3. The radio frequency optical transmission system according to claim 2, wherein the at least one base station includes:

an input switching section for receiving the two phase-conjugated optical signals via the optical transmission path, and selectively outputting a predetermined one of the received two phase-conjugated optical signals in accordance with a transmission distance to the control station; and

a light reception section for converting the predetermined optical signal selectively outputted from the input switching section into a radio frequency signal.

4. The radio frequency optical transmission system according to claim 2, wherein the at least one base station includes:

a first light reception section for receiving one of the two phase-conjugated optical signals via the optical transmission path, and converting the received optical signal into a radio frequency signal;

a second light reception section for receiving another one of the two phase-conjugated optical signals via the optical transmission path, and converting the received optical signal into a radio frequency signal; and

an input switching section for receiving the radio frequency

signals respectively outputted from the first and second light reception sections, and selectively outputting a predetermined one of the received radio frequency signal in accordance with a transmission distance to the control station.

5. The radio frequency optical transmission system according to claim 2, wherein the at least one base station includes:

a first light reception section for receiving one of the two phase-conjugated optical signals via the optical transmission path, and converting the received optical signal into a radio frequency signal;

a second light reception section for receiving another one of the two phase-conjugated optical signals via the optical transmission path, and converting the received optical signal into a radio frequency signal;

an input switching section for receiving the radio frequency signals respectively outputted from the first and second light reception sections, and selectively outputting one of the received radio frequency signals;

a level comparison section for receiving the radio frequency signals respectively outputted from the first and second light reception sections, and comparing the radio frequency signals with respect to a signal power intensity; and

a control section for controlling, based on a comparison result obtained from the level comparison section, the input

switching section so as to select one of the radio frequency signals which has a greater signal power intensity.

6. The radio frequency optical transmission system according to claim 2, wherein the at least one base station includes:

an input switching section for receiving the two phase-conjugated optical signals via the optical transmission path, and selectively outputting one of the received two phase-conjugated optical signals;

a light reception section for converting the optical signal selectively outputted from the input switching section into a radio frequency signal;

a level comparison section for receiving the radio frequency signal outputted from the light reception section, and comparing the received radio frequency signal and a previously received radio frequency signal with respect to a signal power intensity; and

a control section for controlling, based on a comparison result obtained from the level comparison section, the input switching section such that the light reception section always receives a radio frequency signal having a greater signal power intensity.

7. The radio frequency optical transmission system according to claim 1, wherein the control station includes:

a first light source for outputting an optical signal having

a wavelength of $\lambda1$;

a second light source for outputting an optical signal having a wavelength of $\lambda2$ different from the wavelength of $\lambda1$;

a first optical multiplexing section for multiplexing the optical signal having the wavelength of $\lambda1$ and the optical signal having the wavelength of $\lambda2$ into a first multiplexed optical signal;

an optical intensity modulation section for modulating an intensity of the first multiplexed optical signal outputted from the first optical multiplexing section with the radio frequency signal, and for generating two phase-conjugated optical signals based on the first multiplexed optical signal having its intensity modulated;

a first wavelength demultiplexing section for separating only the optical signal having the wavelength of $\lambda1$ from one of the two phase-conjugated optical signals generated by the optical intensity modulation section;

a second wavelength demultiplexing section for separating only the optical signal having the wavelength of $\lambda2$ from another one of the two phase-conjugated optical signals generated by the optical intensity modulation section; and

a second optical multiplexing section for multiplexing the optical signal having the wavelength of $\lambda1$ separated by the first wavelength demultiplexing section and the optical signal having the wavelength of $\lambda2$ separated by the second wavelength demultiplexing section into a second multiplexed optical signal,

and for transmitting the second multiplexed optical signal via the optical transmission path.

8. The radio frequency optical transmission system according to claim 7, wherein the at least one base station includes:

a wavelength demultiplexing section for receiving the second multiplexed optical signal via the optical transmission path, and demultiplexing the second multiplexed optical signal into the optical signal having the wavelength of λ1 and the optical signal having the wavelength of λ2;

an input switching section for receiving the optical signal having the wavelength of λ1 and the optical signal having the wavelength of λ2, and selectively outputting a predetermined one of the optical signal having the wavelength of λ1 and the optical signal having the wavelength of λ2 in accordance with a transmission distance to the control station; and

a light reception section for converting the predetermined optical signal selectively outputted from the input switching section into a radio frequency signal.

9. The radio frequency optical transmission system according to claim 7, wherein the at least one base station includes:

a wavelength demultiplexing section for receiving the second multiplexed optical signal via the optical transmission path, and demultiplexing the second multiplexed optical signal into the

optical signal having the wavelength of λ1 and the optical signal having the wavelength of λ2;

a first light reception section for receiving one of the optical signal having the wavelength of λ1 and the optical signal having the wavelength of λ2, and converting the received optical signal into a radio frequency signal;

a second light reception section for receiving another one of the optical signal having the wavelength of λ1 and the optical signal having the wavelength of λ2, and converting the received optical signal into a radio frequency signal; and

an input switching section for receiving the radio frequency signals respectively outputted from the first and second light reception sections, and selectively outputting a predetermined one of the received radio frequency signals in accordance with a transmission distance to the control section.

10. The radio frequency optical transmission system according to claim 7, wherein the at least one base station includes:

a wavelength demultiplexing section for receiving the second multiplexed optical signal via the optical transmission path, and demultiplexing the second multiplexed optical signal into the optical signal having the wavelength of λ1 and the optical signal having the wavelength of λ2;

a first light reception section for receiving one of the optical signal having the wavelength of λ1 and the optical signal

having the wavelength of λ2, and converting the received optical signal into a radio frequency signal;

a second light reception section for receiving another one of the optical signal having the wavelength of λ1 and the optical signal having the wavelength of λ2, and converting the received optical signal into a radio frequency signal;

an input switching section for receiving the radio frequency signals respectively outputted from the first and second light reception sections, and selectively outputting one of the received radio frequency signals;

a level comparison section for receiving the radio frequency signals respectively outputted from the first and second light reception sections, and comparing the received radio frequency signals with respect to a signal power intensity; and

a control section for controlling, based on a comparison result obtained from the level comparison section, the input switching section so as to select one of the received radio frequency signals which has a greater signal power intensity.

11. The radio frequency optical transmission system according to claim 7, wherein the at least one base station includes:

a wavelength demultiplexing section for receiving the second multiplexed optical signal via the optical transmission path, and demultiplexing the second multiplexed optical signal into the optical signal having the wavelength of λ1 and the optical signal

having the wavelength of λ2;

an input switching section for receiving the optical signal having the wavelength of λ1 and the optical signal having the wavelength of λ2, and selectively outputting one of the received optical signals;

a light reception section for converting the optical signal outputted from the input switching section into a radio frequency signal;

a level comparison section for receiving the radio frequency signal outputted from the light reception section, and comparing the received radio frequency signal and a previously received radio frequency signal with respect to a signal power intensity; and

a control section for controlling, based on a comparison result obtained from the level comparison section, the input switching section such that the light reception section always receives a radio frequency signal having a greater signal power intensity.

12. The radio frequency optical transmission system according to claim 1, wherein the control station includes:

a light source for outputting an optical signal;

an optical intensity modulation section for modulating an intensity of the optical signal outputted from the light source with the radio frequency signal, and generating two phase-conjugated optical signals based on the optical signal having

its intensity modulated;

a first polarized wave adjustment section for adjusting a polarized wave of one of the two phase-conjugated optical signals generated by the optical intensity modulation section;

a second polarized wave adjustment section for adjusting a polarized wave of another one of the two phase-conjugated optical signals generated by the optical intensity modulation section, so as to be perpendicular to the polarized wave of the optical signal which has been adjusted by the first polarized wave adjustment section; and

a polarized wave combining section for combining the optical signals having their polarized waves respectively adjusted by the first and second polarized wave adjustment sections into a combined optical signal, such that their polarized waves are kept perpendicular to each other, the polarized wave combining section transmitting the combined optical signal via the optical transmission path.

13. The radio frequency optical transmission system according to claim 12, wherein the at least one base station includes:

a polarized wave separation section for receiving the combined optical signal via the optical transmission path, and separating the received combined optical signal into two optical signals having their polarized waves perpendicular to each other;

an input switching section for receiving the two optical signals obtained through separation by the polarized wave separation section, and selectively outputting a predetermined one of the received two optical signals in accordance with a transmission distance to the control section; and

a light reception section for converting the optical signal selectively outputted from the input switching section into a radio frequency signal.

14. The radio frequency optical transmission system according to claim 12, wherein the at least one base station includes:

a polarized wave separation section for receiving the combined optical signal via the optical transmission path, and separating the received combined optical signal into two optical signals having their polarized waves perpendicular to each other;

a first light reception section for receiving one of the two optical signals having their polarized waves perpendicular to each other, and converting the received optical signal into a radio frequency signal;

a second light reception section for receiving another one of the two optical signals having their polarized waves perpendicular to each other, and converting the received optical signal into a radio frequency signal; and

an input switching section for receiving the radio frequency

signals respectively outputted from the first and second light reception sections, and selectively outputting a predetermined one of the received radio frequency signals in accordance with a transmission distance to the control station.

15. The radio frequency optical transmission system according to claim 12, wherein the at least one base station includes:

a polarized wave separation section for receiving the combined optical signal via the optical transmission path, and separating the received combined optical signal into two optical signals having their polarized waves perpendicular to each other;

a first light reception section for receiving one of the two optical signals having their polarized waves perpendicular to each other, and converting the received optical signal into a radio frequency signal;

a second light reception section for receiving another one of the two optical signals having their polarized waves perpendicular to each other, and converting the received optical signal into a radio frequency signal;

an input switching section for receiving the radio frequency signals respectively outputted from the first and second light reception sections, and selectively outputting one of the received radio frequency signals;

a level comparison section for receiving the radio frequency

signals respectively outputted from the first and second light reception sections, and comparing the received radio frequency signals with respect to a signal power intensity; and

a control section for controlling, based on a comparison result obtained from the level comparison section, the input switching section so as to select one of the received radio frequency signals which has a greater signal power intensity.

16. The radio frequency optical transmission system according to claim 12, wherein the at least one base station includes:

a polarized wave separation section for receiving the combined optical signal via the optical transmission path, and separating the received optical signal into two optical signals having their polarized waves perpendicular to each other;

an input switching section for receiving the two optical signals into which the received combined optical signal has been separated by the polarized wave separation section, and selectively outputting one of the received two optical signals;

a light reception section for converting the optical signal selectively outputted from the input switching section into a radio frequency signal;

a level comparison section for receiving the radio frequency signal from the light reception section, and comparing the received radio frequency signal and a previously received radio frequency

signal with respect to a signal power intensity; and

a control section for controlling, based on a comparison result obtained from the level comparison section, the input switching section such that the light reception section always receives a radio frequency signal having a greater signal power intensity.

17. The radio frequency optical transmission system according to claim 2, wherein the optical intensity modulation section includes a Mach-Zehnder interferometer.

18. The radio frequency optical transmission system according to claim 7, wherein the optical intensity modulation section includes a Mach-Zehnder interferometer.

19. The radio frequency optical transmission system according to claim 12, wherein the optical intensity modulation section includes a Mach-Zehnder interferometer.

20. The radio frequency optical transmission system according to claim 2, wherein the optical intensity modulation section is made of a crystal having an electrooptic effect.

21. The radio frequency optical transmission system according to claim 7, wherein the optical intensity modulation

section is made of a crystal having an electrooptic effect.

22. The radio frequency optical transmission system according to claim 12, wherein the optical intensity modulation section is made of a crystal having an electrooptic effect.

23. The radio frequency optical transmission system according to claim 20, wherein the crystal having the electrooptic effect is lithium niobate.

24. The radio frequency optical transmission system according to claim 21, wherein the crystal having the electrooptic effect is lithium niobate.

25. The radio frequency optical transmission system according to claim 22, wherein the crystal having the electrooptic effect is lithium niobate.

26. The radio frequency optical transmission system according to claim 2, wherein the optical transmission path is an optical fiber, and a zero-dispersion wavelength range of the optical fiber is different from a wavelength range of the light source.

27. The radio frequency optical transmission system

according to claim 7, wherein the optical transmission path is an optical fiber, and a zero-dispersion wavelength range of the optical fiber is different from a wavelength range of the light source.

28. The radio frequency optical transmission system according to claim 12, wherein the optical transmission path is an optical fiber, and a zero-dispersion wavelength range of the optical fiber is different from a wavelength range of the light source.

29. The radio frequency optical transmission system according to claim 26, wherein the zero-dispersion wavelength range of the optical fiber is a 1.3 μm range, and the wavelength range of the light source is a 1.55 μm range.

30. The radio frequency optical transmission system according to claim 27, wherein the zero-dispersion wavelength range of the optical fiber is a 1.3 μm range, and the wavelength range of the light source is a 1.55 μm range.

31. The radio frequency optical transmission system according to claim 28, wherein the zero-dispersion wavelength range of the optical fiber is a 1.3 μm range, and the wavelength range of the light source is a 1.55 μm range.

32. A control station for optically transmitting a radio frequency signal to a base station, the control station comprising:

a light source for outputting an optical signal having a wavelength of λ1; and

an optical intensity modulation section for modulating an intensity of the optical signal outputted from the light source with the radio frequency signal, and generating two phase-conjugated optical signals based on the optical signal having its intensity modulated.

33. The control station according to claim 32, further comprising:

a second light source for outputting an optical signal having a wavelength of λ2 different from the wavelength of λ1;

a first optical multiplexing section for multiplexing the optical signal having the wavelength of λ1 and the optical signal having the wavelength of λ2;

a first wavelength demultiplexing section for separating only the optical signal having the wavelength of λ1 from one of the two phase-conjugated optical signals generated by the optical intensity modulation section;

a second wavelength demultiplexing section for separating only the optical signal having the wavelength of λ2 from another one of the two phase-conjugated optical signals generated by the

optical intensity modulation section; and

a second optical multiplexing section for multiplexing the optical signal having the wavelength of λ1 separated by the first wavelength demultiplexing section and the optical signal having the wavelength of λ2 separated by the second wavelength demultiplexing section,

wherein the optical intensity modulation section uses the radio frequency signal to modulate an intensity of a multiplexed optical signal outputted from the first optical multiplexing section, rather than an intensity of either the optical signal having the wavelength of λ1 outputted from the first light source or the optical signal having the wavelength of λ2 outputted from the second light source.

34. The control station according to claim 32, further comprising:

a first polarized wave adjustment section for adjusting a polarized wave of one of the two phase-conjugated optical signals generated by the optical intensity modulation section;

a second polarized wave adjustment section for adjusting a polarized wave of another one of the two phase-conjugated optical signals generated by the optical intensity modulation section, so as to be perpendicular to the polarized wave of the optical signal which has been adjusted by the first polarized wave adjustment section; and

a polarized wave combining section for combining the optical signals having their polarized waves respectively adjusted by the first and second polarized wave adjustment sections into a combined optical signal, such that their polarized waves are kept perpendicular to each other, the polarized wave combining section transmitting the combined optical signal via the optical transmission path.

35. A method for optically transmitting a radio frequency signal from a control station to at least one base station, the method comprising the steps of:

modulating an intensity of a predetermined optical signal with the radio frequency signal;

generating two phase-conjugated optical signals based on the optical signal having its intensity modulated;

transmitting the generated two phase-conjugated optical signals in a predetermined transmission form via an optical transmission path;

receiving the two optical phase-conjugated signals transmitted in the predetermined transmission form via the optical transmission path;

selecting one of the received two phase-conjugated optical signals which has a greater signal power intensity; and

converting the selected optical signal into the radio frequency signal.